63-3-1

Not Classified

3rd QUARTERLY ENGINEERING REPORT

for

EXPERIMENTAL CATHODE RAY TUBES WITH FIBER OPTIC INSERTS IN FACEPLATE

THIS REPORT COVERS THE PERIOD FROM OCTOBER 28, 1962 through January 27, 1963

THE RAULAND CORPORATION

5600 JARVIS AVENUE, CHICAGO 48, ILLINOIS

NAVY DEPARTMENT BUREAU OF SHIPS ELECTRONICS DIVISIONS

CONTRACT NObrs-87395

March 8, 1963

NOT CLASSIFIED

PART I

PURPOSE

This report relates to the construction of two cathode-ray tubes having fiber optic inserts. These tubes should be similar to cathode-ray tube Type 10KP7-A, except that P-25 phosphor is used instead of P-7 and there shall be a fiber optic insert 3" x 3" located near the outer edge of the useful screen area.

PART II

A. - GENERAL

Since the second quarterly engineering report, both tubes have been completed. One tube met all specifications, was accepted by the Navy Inspector and shipped. The second tube met all electrical and mechanical specifications, but there was a slight etch in the fiber optic area. We have received permission to ship this tube, also and are presently awaiting the bill of lading.

III. FIBER OPTICS

As indicated in our January monthly report, the fiber optic section consists of grey cladded fiber optics. The fiber size being 15 microns in diameter. The numerical aperture of the fiber section is .66 and there is no overlay or overcoating of the fiber insert.

IV. SCREENING

Following leak testing, processing and polariscope examination of the bulbs, they were turned over for screening with P-25 phosphor. Before screening these actual bulbs, considerable work was done on duplicate bulbs of the same variety in order to develop a screening formula which could be readily removed if found necessary. It was recognized that the presence of lead glass would render the fiber optic insert extremely sensitive to the acid cleaning

operation used prior to screening. Lead glasses are notoriously soluble in hydrofluoric acid used for cleaning. It was considered important to develop modified screen formulae since it is usually necessary in making good cathode ray high quality good resolution screens to rescreen several times. Some work was done toward using a detergent cleaning method in lieu of hydrofluoric acid, but this was not carried out to a successful conclusion since there was an indication of a stain left during subsequent bake where traces of the detergent remained. It is, however, believed that with more work detergent cleaning can be successful. We proceeded with the screening using hydrofluoric acid cleaning of a more dilute vaiety for a shorter period of time than usual. For screening we used the liquid sedimentation method with barium nitrate and potassium silicate as coagulating medium in deionized water.

For filming, we first tried nitrocellulose flotation, but could not get sufficient adherence of the film so that it would not lift off with the "soft" screening formulas we were using. We, therefore, changed to a conventional spray filming procedure using methacrylate resins dissolved in toluene and a new "harder" screening formula. Following filming, the bulbs were aluminized with 90 milligrams of aluminum at a distance of 9".

V. BULB BAKE AND EXHAUST

Following aluminizing and dagging, the bulbs were then baked at a peak temperature of 380°C for twenty minutes using the slow heating and cooling rates of 1 1/2°C per minute. Following the bake out of the completed screen bulbs, high resolution guns were sealed in with a lathe in a conventional manner and the entire assembly was then put through the exhaust cycle. For exhaust, a bake temperature of 360°C was used with the slow heating and cooling rates given previously. The bake cycles and exhaust cycles of the bulbs proved successful despite the high internal stress of the fiber insert. No bulb was lost in either of these operations.

VI. COMPLETED TUBES

The two tubes called for in this contract have now been completed. No additional work is scheduled except the final engineering report which will describe the various details in greater length.